p. 316), gives a brief but complete summary, except that he does not mention the possibility of obtaining successive roots by starting alternately on the two curves. He also demonstrates the geometric representation, shows that $\phi^n(x)$ may approach "in regular succession to different limits," and notes the connection of iteration with many parts of algebra and the calculus.

More recently, Léméray has a series of papers on the functional side of the theorem. In one of the earliest of these ("l'Intermédiaire des Mathematiciens," June, 1894) he considers in detail the conditions of convergence of $\phi^n(x)$, but thinks that the method is not generally applicable for the solution of equations (which is incorrect). In this and succeeding papers he gives ample geometric illustrations, including both the "staircase" and the "spiral" procession, but exhibits few examples. He deals at length with the "stagnating spiral" procession.

It will thus be seen that the first paper of Prof. Heymann mentioned by Herr Sattler has about the same date as the first paper by Léméray. Many other papers have followed. According to Heymann, Isenkrahe described (1897) both the "staircase" and "spiral" process under those names (which have been used by me). Mr. Stott has found other references (which we have not yet been able to verify), especially Anostschenko (1901), Pellet (1901), and Bugaieff, who appears to have published a series of papers since 1896, covering the whole subject of successive approximation (in Russian).

The work by Prof. Heymann which Herr Sattler sends me (No. 5) is dated 1904. It commences by describing the process, with both forms of approach; discusses the determination of imaginary roots, hastening of convergency, Newton's method, expedients for calculation, and some of the literature of the subject; considers the "stagnating" spiral, and gives examples and figures, being thus the most thorough paper which I have seen on the equation side of the theorem.

It would seem, then, that the method has been known to many writers since the time of Dary and Newton, but none of them appears to have carried it much further than the more obvious deductions to be drawn from the original theorem, as shown in my note. I think, however, that some further developments, both on the theoretical and the practical side, remain to be considered, but it would be scarcely useful to mention them until we have been able to examine all the literature.

We shall be very glad to receive any further references on the subject. If an amateur may say so, it is extraordinary that so beautiful and general a method should have received so little attention in the text-books.

RONALD ROSS.

University of Liverpool, January 11.

A February Meteoric Shower.

FEBRUARY cannot offer the same attraction as January and April in regard to the occurrence of a meteoric shower of special importance; but large meteors are fairly abundant during the month, and though no exceptionally rich streams are in evidence, there are a number of minor systems in play, and these will well repay attentive observation.

For a great many years I have suspected a strong shower in this month, but have never thoroughly investigated it. Meteors have been prolific from the direction of the bright star α Aurigæ (Capella), and the dates over which the display extends appear to be from the 5th to the 20th. This year the moon will not much interfere with observation between February 10 and 25, and the sky should be carefully watched on clear nights for these Aurigids. They are brilliant, slow-moving meteors, and occasionally take rank as fireballs.

It will be important to determine the date of maximum and the exact place of the radiant. I found the position at 75°+41° from various meteors seen from Bristol in the month of February in various years, but I have never watched the shower with sufficient thoroughness to learn much of its aspect or discover the epoch of its richest presentation; but I think it is decidedly a stream of rather notable character, and one which obviously needs further attention.

W. F. DENNING.

Women and the Fellowship of the Chemical Society.

IT has come to our notice that a report has been widely circulated and credited to the effect that the movement in favour of the admission of women to the fellowship of the Chemical Society is directly connected with the present strenuous agitation for the political enfranchisement of women. We, the undersigned women (actively engaged in chemical teaching and research), beg to ask for the hospitality of your columns in order emphatically to deny any such connection. The following facts, we venture to think, should conclusively prove the independence of the two movements:—

(1) Five years ago, when some of us petitioned the council of the Chemical Society to admit us to the fellowship, the agitation in favour of "Woman Suffrage" was not prominently before the public.

(2) The petition recently presented to the council originated within the Chemical Society itself, and was signed exclusively by fellows of the society. Moreover, we as a body have no knowledge of the political opinions and aspirations held by individual members; any such knowledge we should consider to be quite irrelevant, since the only link which unites us is a common interest in the science of chemistry.

We are glad to take this opportunity of recording our thanks to those fellows of the Chemical Society who have expressed themselves in favour of admitting women to the fellowship of the society.

Signed: MARY BOYLE, B.Sc., Lecturer and Demonstrator in Chemistry, Royal Holloway College; K. A. BURKE, B.Sc., Assistant in Department of Chemistry, University College, London; LOUISA CLEAVERLEY; MARGARET D. DOUGAL, Indexer of the Publications of the Chemical Society; C. DE B. EVANS, D.Sc., Lecturer in Chemistry, London School of Medicine for Women; E. ELEANOR FIELD, M.A., Senior Staff Lecturer in Chemistry, Royal Holloway College; EMILY L. B. FORSTER, Private Assistant to Prof. Huntington, King's College, London; IDA FREUND, Natural Science Tripos, Cambridge, Staff Lecturer in Chemistry, Newnham College; MAUD GAZDAR; HILDA J. HARTLE, B.Sc., Lecturer in Chemistry, Homerton Training College, Cambridge; E. M. HICKMANS, M.Sc.; ANNIE HOMER, B.A., Fellow and Associate of Newnham College, Cambridge; IDA F. HOMFRAY, B.Sc.; E. S. HOOPER, B.Sc., F.I.C., Assistant Lecturer and Demonstrator, Portsmouth Municipal College; EDITH HUMPHREY, B.Sc., Ph.D., Chemist to A. Sanderson and Sons; ZELDA KAHAN, B.Sc.; NORAH E. LAYCOCK, B.Sc., Demonstrator in Chemistry, London School of Medicine for Women; EFFIE G. MARSDEN; MARGARET MCKILLOP, M.A., Lecturer in Chemistry, King's College, Women's Department; AGNES M. MOODIE, M.A., B.Sc.; NORA RENOUF, Salters' Research Fellow, School of Pharmacy; IDA SMEDLEY, D.Sc., Assistant Lecturer and Demonstrator in Chemistry, Victoria University, Manchester; ALICE E. SMITH, B.Sc., Assistant Lecturer and Senior Demonstrator in Chemistry, University College of North Wales, Bangor; MILLICENT TAYLOR, B.Sc., Lecturer in Chemistry, Ladies' College, Cheltenham; M. BEATRICE THOMAS, M.A., Lecturer in Chemistry, Girton College, Cambridge; M. A. WHITELEY, D.Sc., A.R.C.S., Demonstrator in Organic Chemistry, Royal College of Science, London; SIBYL T. WIDDOWS, B.Sc., Head of Practical Chemistry Department, London School of Medicine for Women; KATHARINE I. WILLIAMS.

Fog and Rime on January 27–28.

THE great fog which enveloped the neighbourhood of London as well as a large part of England on January 27 and 28 was remarkable in rural and outer-suburban districts for the beautiful decking of the trees, even the tallest elms, with a great thickness of rime.

Here at Northwood, sixteen miles to the north of London, twigs and branches were heavily laden on their windward side—or rather that which faced the direction of the feeble anti-cyclonic air-flow. At night time, when

the fog was very dense, one's hair and overcoat also received a thick deposit of hoar-frost. It is noteworthy that in central London the fog, being exceedingly carbonaceous, and pungent with SO_2, was too dry to deposit much ice or rime on the trees in Hyde Park, although the grass was thickly coated through terrestrial radiation. I have never seen much hoar-frost on the bare forest trees *without fog*, and I think that other observers will agree that the presence of fog is necessary for any great thickness to be formed. The dryness of the smoky town-fog as compared with the country-fog is well known, and this whether the temperature of the air is below the freezing point, as in the case in question, or above it. On the above dates at Northwood the fog dispersed for a couple of hours at mid-day, and the sun shone upon a fairy-land in a sky of cloudless blue.

L. C. W. BONACINA.

Northwood, Middlesex, February 1.

Germination of the Broad Bean Seed.

THE text-book statements on the relation of the micropyle to the radicle are entirely wrong so far as I have been able to observe. If the testa be carefully removed it will be found to have two compartments, the larger one covering the cotyledons and the smaller sheathing the radicle. A fine bristle passed through the micropyle enters the cotyledon compartment. When the radicle emerges it does not pass through the micropyle, which is left intact, but the testa splits along two lines of weakness running from the tip of the radicle to its junction with the cotyledon stalks.

I noticed this about six years ago, and though I attach no importance to the mere fact, its interest is considerable from the point of view of nature-study in schools.

E. HEBER-SMITH.

Episcopal Training College for Teachers, Dalry House, Orwell Place, Edinburgh, January 19.

"Vestiges of the Natural History of Creation."

IN "Vestiges of Creation," ninth edition, 1851, p. 113, it is stated that two independent investigators caused the production of "living insects" (*Acarus crossii*) by the prolonged action of a voltaic battery upon certain chemical solutions. The description is most matter-of-fact. The second experimenter seems to have sterilised his apparatus and solutions before use; yet it is said that the insects "were sometimes observed to go back to the fluid to feed, and occasionally they devoured each other." In Note 54 it is also stated that "after they have escaped from the solution they live in the neighbourhood, and readily breed."

I shall be much obliged if any reader can explain the above phenomenon, or say if the experiments have been repeated.

F. WYVILLE THOMSON.

Caledonian United Service Club, Edinburgh, January 28.

THE RADIUM INSTITUTE.

THE announcement that, on the initiative of the King, a Radium Institute will shortly be opened in London is of the greatest interest to the man of science and to the physician. The institute is intended not only for research work, but also for curative purposes, and it will have an organised medical department. The whole of the funds necessary to build, equip, and maintain a new establishment are being provided by Sir Ernest Cassel and Lord Iveagh. We are reminded that Lord Iveagh gave the munificent sum of 250,000*l.* to endow the Lister Institute of Preventive Medicine, so that his name will now be associated gratefully with two great endowments of science. The committee of the institute will consist of Sir Frederick Treves, Bart., G.C.V.O., C.B. (chairman), Sir William Ramsay, K.C.B., F.R.S., Sir J. J. Thomson, F.R.S., the Hon. R. J. Strutt, F.R.S., Sir Lauder Brunton, Bart., F.R.S., Sir Malcolm Morris, K.C.V.O., and two other members, one each to be nominated by Sir Ernest Cassel and Lord Iveagh.

The interest which the King is exhibiting in the inauguration of a scientific institution for further research work with radium, so that its powers may be utilised for the amelioration of human suffering, has led to the publication in the Press of the useful purposes to which radium may be put, and the inauguration of the Radium Institute will provide another example of the supreme importance to mankind of research work in science. The difficulty hitherto has been that so little of this remarkable body has been available for research. The trouble has been a financial one. Not long ago good specimens of radium bromide were obtainable for 5*l.* per milligramme, but recently the price has reached 16*l.* to 18*l.* per milligramme. It is obvious that in any case an enormous expenditure is required before a sufficiency can be obtained adequate for an institute, for the investigation of the properties of radium and its application for the treatment of disease. The necessary funds having now been provided, it will be possible to study radium from many points of view.

Radium is the most interesting of a group of bodies characterised by the property of spontaneously emitting radiations capable of passing through plates of metal or other substances impermeable to light. In 1896, Becquerel found that uranium compounds and the metal itself give off rays which cause changes in a photographic plate even when passed through thin plates of metal. Uranium was isolated from pitchblende so long ago as 1789 by Klapworth, and a little more than a hundred years later, in 1898, M. and Mme. Curie discovered that certain varieties of this mineral possess greater radioactivity than could be accounted for by the uranium they contained. They were led to investigate these forms of pitchblende, and succeeded in isolating two new elements, polonium and radium.

The discovery of radium and its investigation have opened up enormous fields of research, and the following brief account of what has been done will suggest the possibilities before the Radium Institute, especially if a considerable quantity of the element can be under investigation.

Radium gives off three kinds of rays, respectively called α, β, γ rays, which have various properties. The α rays are identical with the radiations of high velocity, carrying a positive charge of electricity, which are projected through a perforation in the kathode of a Crookes's tube. They have been called "canal rays" by Goldstein, and have been investigated particularly by Wien. They travel in the opposite direction to the current through the tube, and have the power of ionising gases. The β rays consist of negative particles, identical with the rays which are given off from the kathode and called "kathode rays." They have a velocity equal to that of light, and can be deviated by a magnetic field. The γ rays are similar to the X-rays. They are not deflected by a magnetic field.

These rays have different powers of penetration. This is estimated by interposing layers of aluminium. The α rays have the least penetrative power; according to Rutherford, they may be taken as unity, the β rays as of a penetrative power of 100, and the γ rays as of a penetrative power of 10,000. Practically the rays may be filtered by interposing layers of aluminium and lead. For instance, both the α and β rays are completely absorbed by a layer of lead only one centimetre thick, but the γ rays will pass through a layer of lead an inch thick. They are more penetrating than the X-rays.